1 391 080

PATENT SPECIFICATION

(11) 1 391 080

(21) Application No. 43989/72 (22) Filed 22 Sept. 1972
(31) Convention Application No. 2 147 284
(32) Filed 22 Sept. 1971 in
(33) Germany (DT)
(44) Complete Specification published 16 April 1975
(51) INT CL² B26F 3/14; B23K 26/00
(52) Index at acceptance
B4B 70E
B3V 4A2

(19)

(54) CUTTING BY LASER BEAM

(71) We, MESSER GRIESHEIM GMBH, a Company organised under the laws of Germany, of Frankfurt/Main, Hanauer Landstrasse 300, Germany, do hereby declare the invention for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

The invention relates to a method for supporting a workpiece during laser cutting.

In the cutting of metallic or non-metallic workpieces it is necessary adequately to support the work, whether the work be a textile fabric or a slab of material. If, however, a laser beam is used as the cutting tool a table having smooth surface cannot be employed for supporting the work, since the laser beam penetrating the workpiece may be reflected at the smooth surface of the table or it may pass into it. Furthermore, the vapours which appear during cutting and also the cutting gases (oxidising, reducing or inert gases) which get onto or into the kerf cannot be drawn off from below, and this greatly impairs the quality of the final cut.

It is therefore an object of the present invention to provide a method for supporting and cutting a workpiece which is not subject to the disadvantages mentioned above.

According to the present invention there is provided a method of cutting a workpiece by means of a laser beam, comprising supporting said workpiece on a support member comprising a plurality of pointed or knife-edged support elements, and cutting the workpiece with the laser beam.

Using this technique, it is possible to provide an aspiration or suction device beneath the workpiece, by means of which device vapours occurring during the cutting process as well as the shielding gas can be sucked off. A further effect which is obtained by the use of the pointed or knife-edged support elements is that no laser beams which have penetrated the work are reflected back on to it.

In a preferred embodiment of the present invention the knife-edged support elements are arranged in the form of a honeycomb grid. With sufficient open space for the aspiration of the resulting vapours it is possible even for very thin and yielding materials to be supported adequately on an arrangement of this kind.

Particularly for use in the cutting of materials having a very low flexural stiffness, such as textiles, a further advantageous embodiment of the present invention provides that the support elements shall take the form of strips or discs (including rotatable discs) which are disposed at a definite distance apart and each of which have one side bevelled.

In another embodiment of the present invention, the support elements may be constructed in the form of pins, the points of which are conical or pyramidal. A support of this type can be used with advantage when cutting materials having a high flexural stiffness.

Preferably the angle of the tip of each of the support elements is at most 6°. Such an angle has proved particularly advantageous in obviating interfering and spurious reflections.

If desired, a plurality of sets of support elements may be combined together to form a link chain. Such an arrangement is especially suitable for use in cutting workpieces which are moved continuously under the laser beam. Rotating discs also serve the same purpose.

In a further embodiment of the present invention, the region beneath the supporting arrangement takes the form of a laterally closed space, bounded by peripheral bounding members. An aspirating device which is connected with this space produces a sub-atmospheric pressure in the space, as a result of which, especially in textile cutting, the laser and shielding gas

beam passing through the workpiece can pass out downwardly with greater ease.

The invention will now be further described by way of example with reference to the accompanying drawings in which:

Figure 1 is a diagrammatic, perspective view of a device for supporting a workpiece during laser cutting;

Figure 2 is a diagrammatic side elevation of the device of Figure 1;

Figure 3 is a diagrammatic side elevation of another form of device for supporting a workpiece during laser cutting;

Figure 4 is a view in the direction of the arrow in Figure 3; and

Figure 5 is a perspective view of a further form of device for supporting a workpiece during laser cutting.

Referring first to Figures 1 and 2, a device for supporting a workpiece during laser cutting includes support elements 2 of copper or aluminium. The support elements 2 are constructed in the form of strips and are connected by means of pins 3 and spacing pieces 4 to form a support unit 6. The upper part of the right-hand side of each of the strips 2 is bevelled and forms an angle α with the other (straight) side. This angle α should not exceed about 6°. A workpiece 1 is shown resting on the sharp upper edges of the strips 2.

A laser beam 5 may be moved above the workpiece 1 carried on the support unit 6. Alternatively, the laser beam 5 may remain stationary if the support unit 6 is moved. As may be seen from Figure 2, if the laser beam strikes a support-element 2, the beam is reflected away from the workpiece in every case and so the cutting process is not affected by reflections.

Figures 3 and 4 illustrate how, so as to effect continuous movement of workpieces under a laser beam, the support units 6 can be connected together into a link chain which moves around a roller 7 like a conveyor belt and carries the workpieces 1.

A further embodiment of the present invention is illustrated in Figure 5. Here the support elements 8 are connected up so as to form a honeycomb grid. With such an arrangement, even very thin and pliant workpieces can be supported adequately for the cutting process.

WHAT WE CLAIM IS:—

1. A method of cutting a workpiece by means of a laser beam comprising supporting said workpiece on a support member comprising a plurality of pointed or knife-edged support elements, and cutting the workpiece with the laser beam.

2. A method according to claim 1, wherein the support member comprises a plurality of knife-edged support elements arranged in the form of a honeycomb grid.

3. A method according to claim 1, wherein the support elements are constructed as strips or discs each having one side bevelled and are spaced one from another.

4. A method according to claim 1, wherein the support elements are constructed in the form of pins, the points of which are conical or pyramidal.

5. A method according to claim 4 wherein each point is formed at an angle of about 6°.

6. A method according to claim 1 wherein the support member comprises a plurality of support elements connected together to form a link chain.

7. A method according to any one of the preceding claims wherein the region below the support elements is bounded by peripheral bounding members and communicates with a vacuum pump.

8. A method of cutting a workpiece by laser beam, substantially as hereinbefore described with reference to Figures 1 and 2, Figures 3 and 4, or Figure 5 of the accompanying drawings.

For the Applicants,
CARPMAELS & RANSFORD,
Chartered Patent Agents,
43 Bloomsbury Square,
London, WC1A 2RA.

Printed for Her Majesty's Stationery Office by the Courier Press, Leamington Spa, 1975.
Published by the Patent Office, 25 Southampton Buildings, London, WC2A 1AY, from which copies may be obtained.

1391080 COMPLETE SPECIFICATION
2 SHEETS This drawing is a reproduction of the Original on a reduced scale
Sheet 1

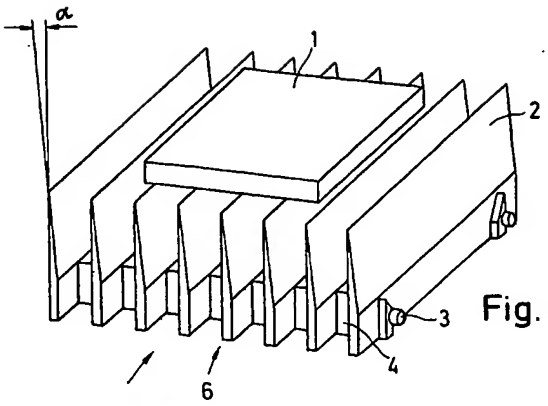

Fig. 1

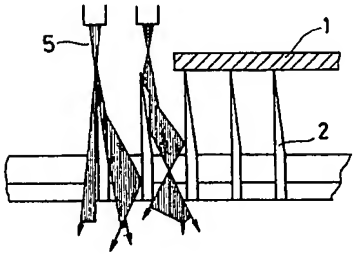

Fig. 2

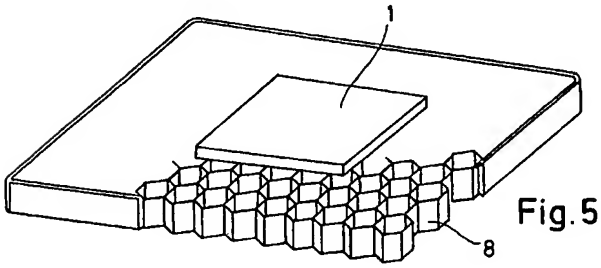

Fig. 5

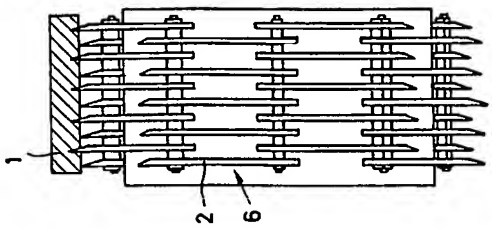

Fig.4

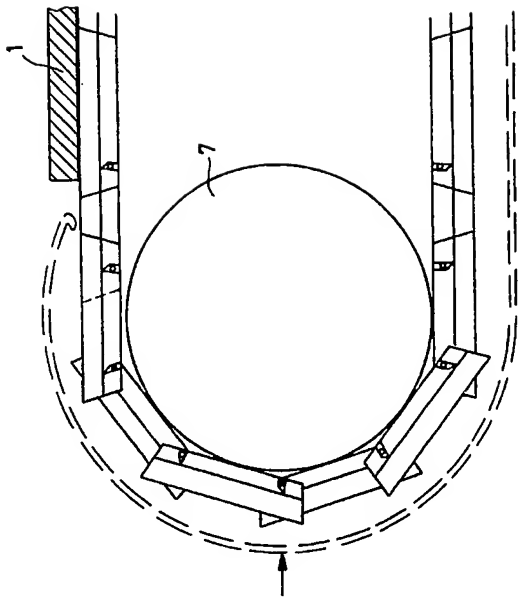

Fig.3